

Lab activities @LNF

Status Report

G. Finocchiaro – INFN LNF

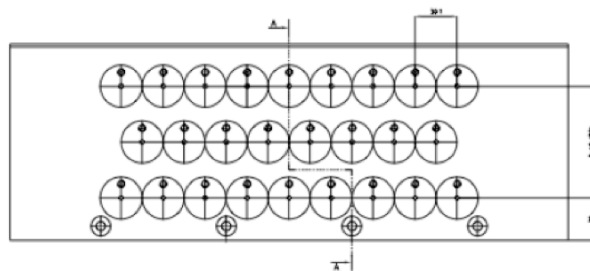
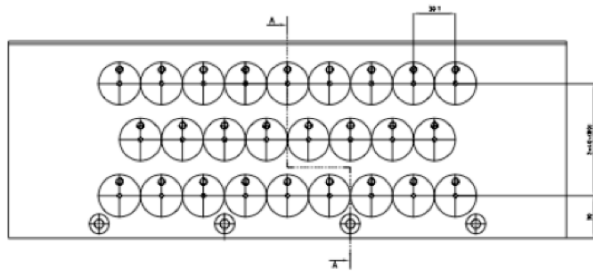
XI SuperB General Meeting

DCH-II parallel session
LNF, 2 December 2009

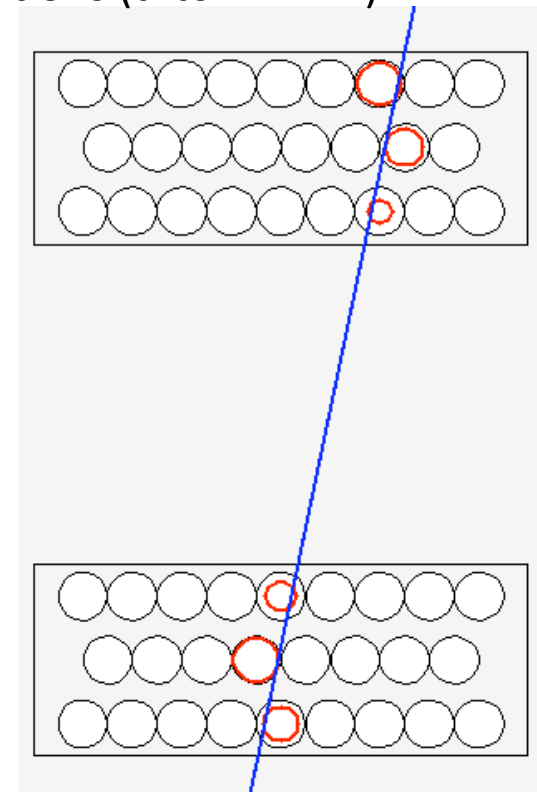
Tracking telescope

REMINDER:

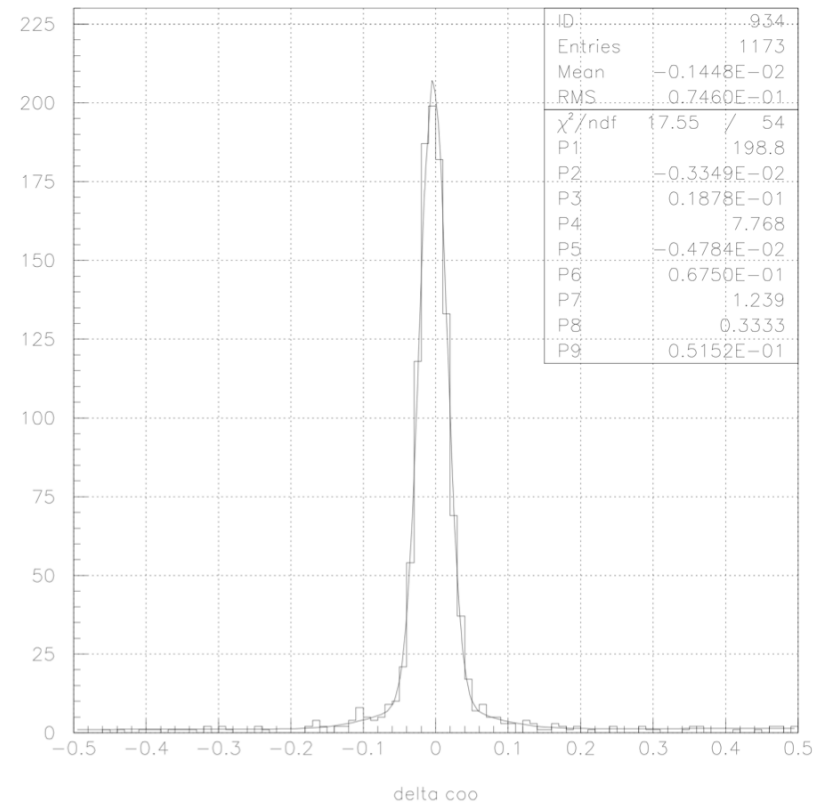
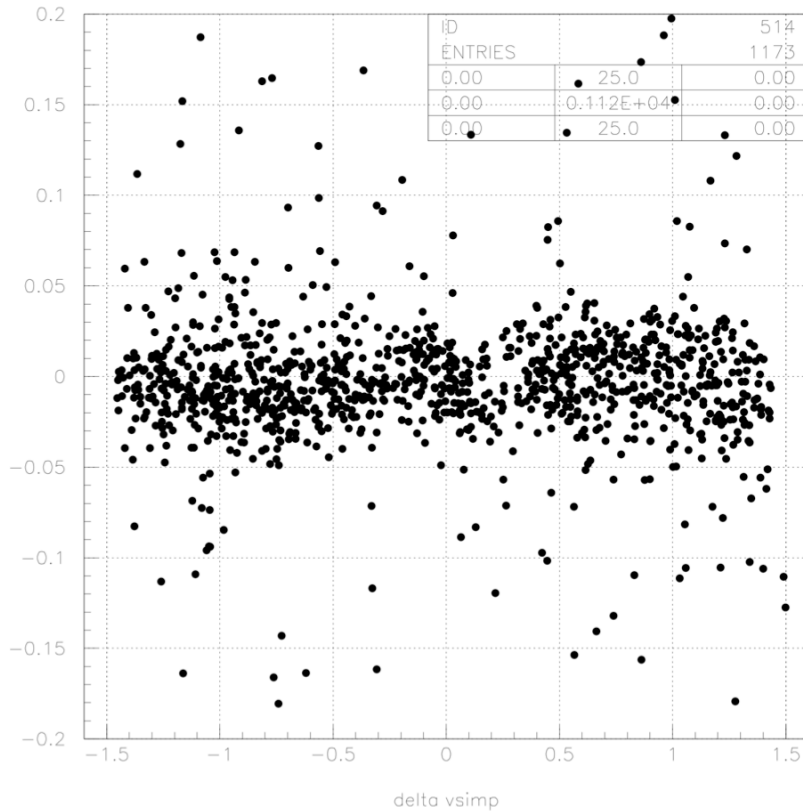
- ✓ Two identical assemblies of 26 tubes each
- ✓ Operated in LS mode
- ✓ 3 cm diameter, 100 μm wires
- ✓ 40%-60% Ar- iC_4H_{10} mixture



- Require hits in top and bottom layer of each tracker
- Perform track fit using approximate space-time relations ($t=t_0+Ar^2+Br$)



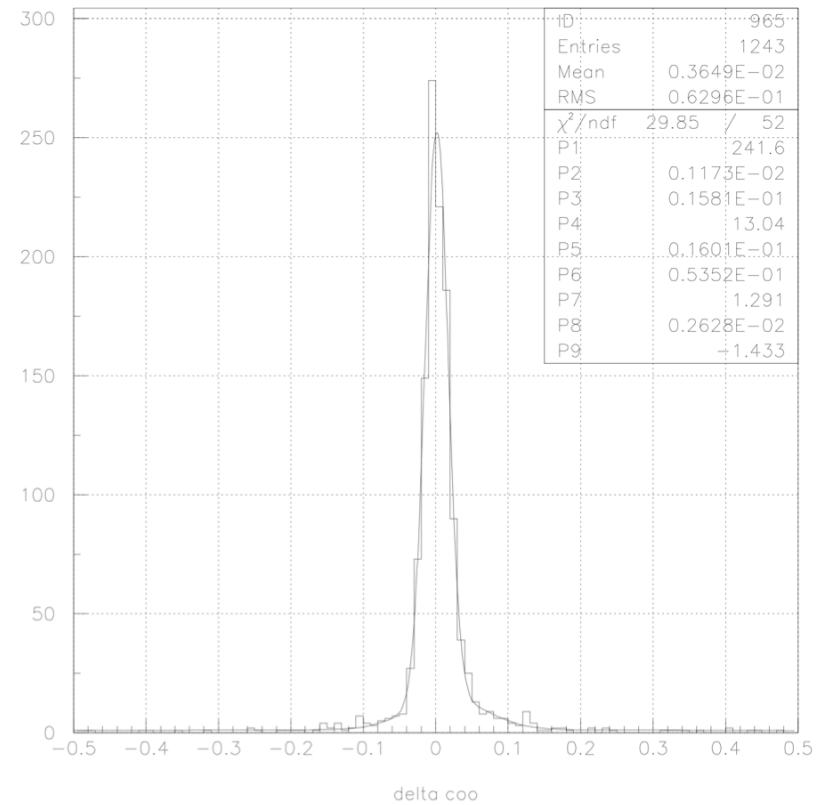
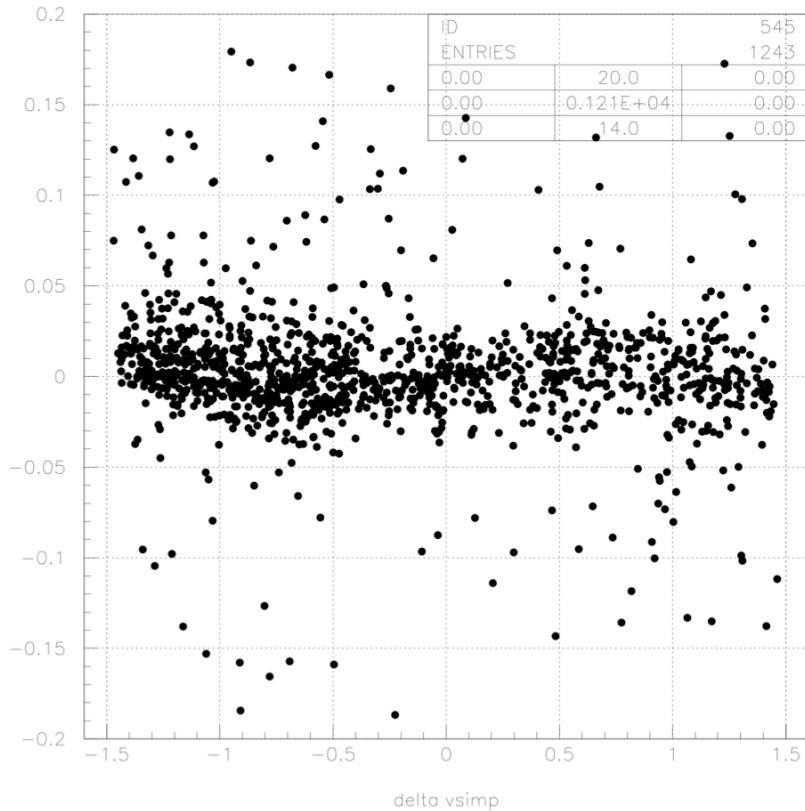
Track residuals vs. impact parameter



Tube #14, middle layer of upper tracker (not included in fit)

- Average sigma~180 μ m
- locally, sigma 150 μ m (~115 μ m from each tube)

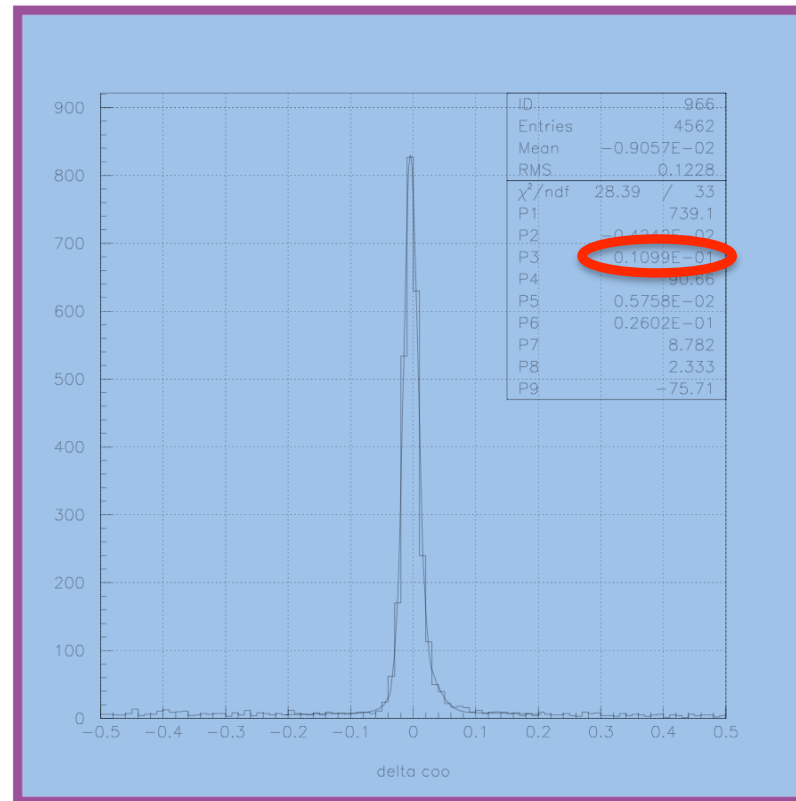
Track residuals vs. impact parameter



Tube #45, middle layer of lower tracker (not included in fit)

- Average sigma $\sim 160\mu\text{m}$
- locally, sigma $130\mu\text{m}$ ($\sim 110\mu\text{m}$ from each tube)

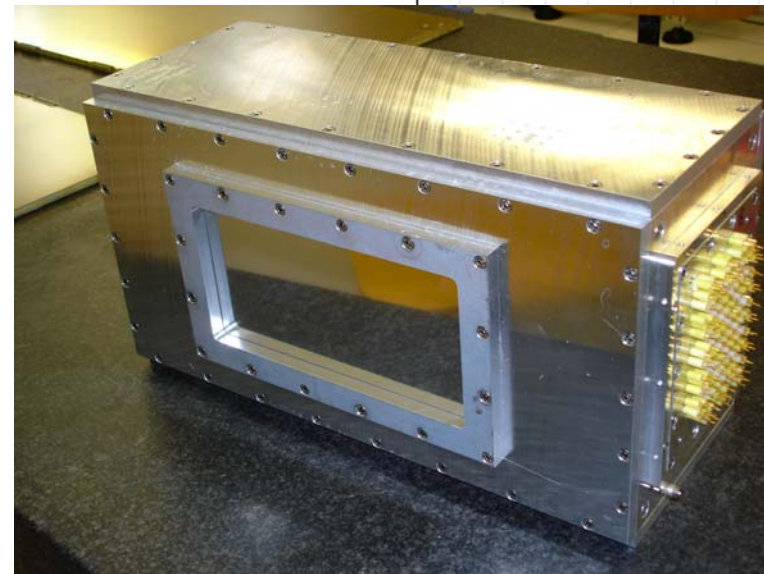
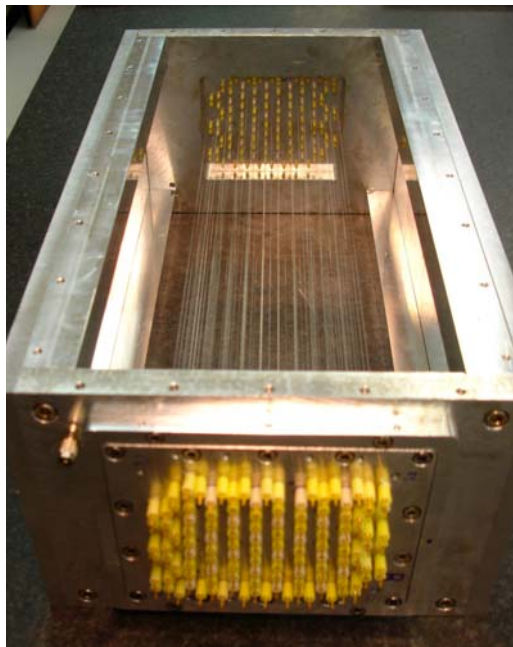
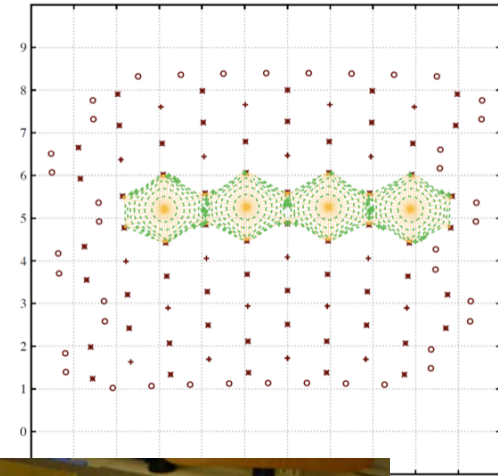
Track impact parameter resolution



Middle layer of upper tracker – all tubes together $\sim 100\mu\text{m}$ resolution
→ expected extrapolation accuracy on drift chamber prototype
(between the two trackers) $\sim 50\mu\text{m}$

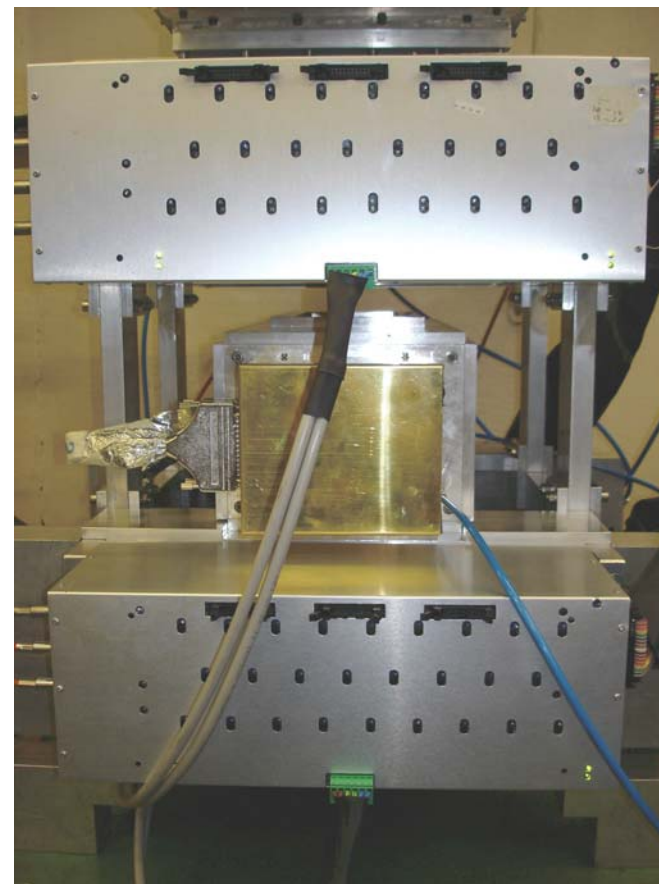
DCH prototype 1

- 6x4 hexagonal cells à la BaBar
 - Guard wires guarantee uniformity of electric field among cells down to $\sim 1\%$
 - Aluminized mylar windows on entrance-exit faces

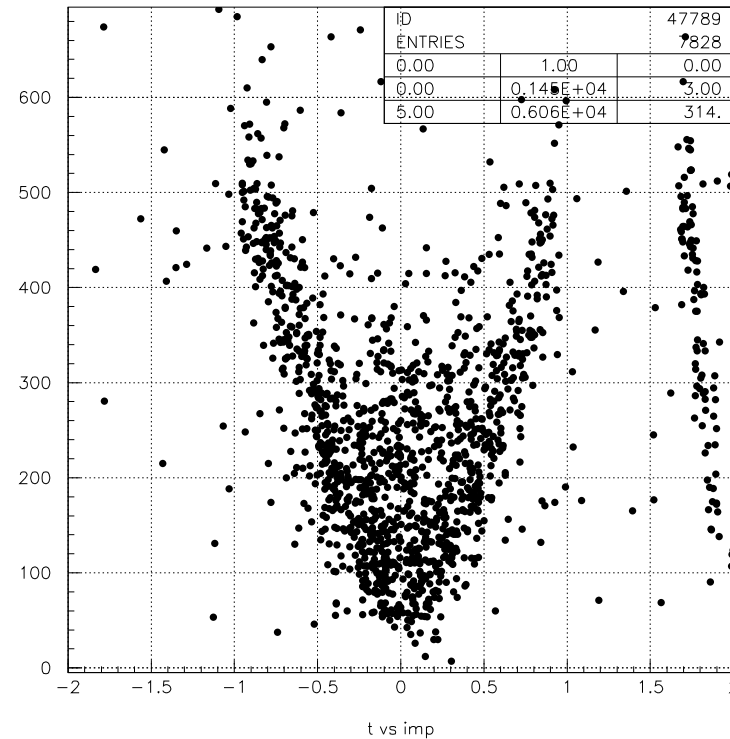
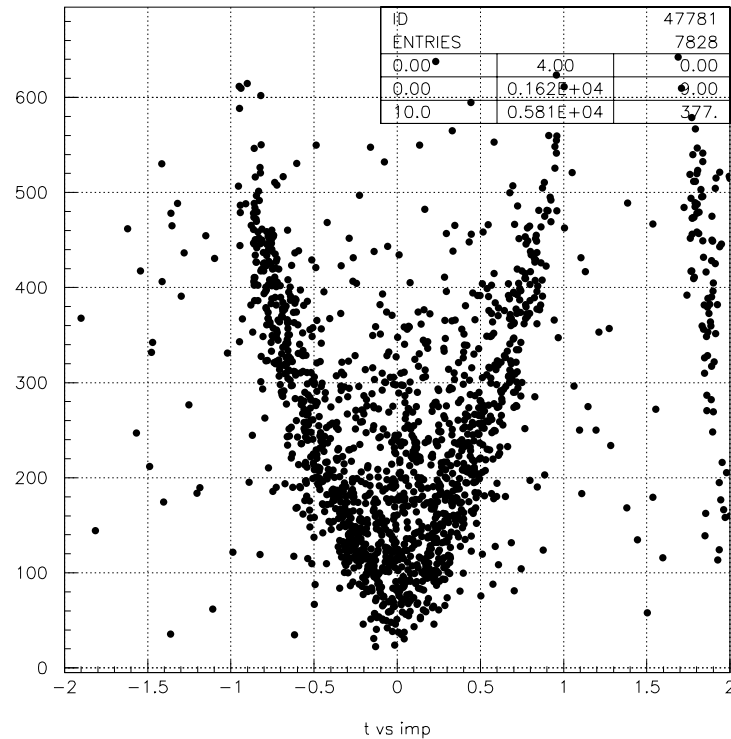


DCH prototype 1 (cont.)

- Readout electronics fully commissioned
- Using BaBar's 80%He-20% i C₄H₁₀ gas now
 - volume is small, changing mixture is fast
- taking cosmic ray data now



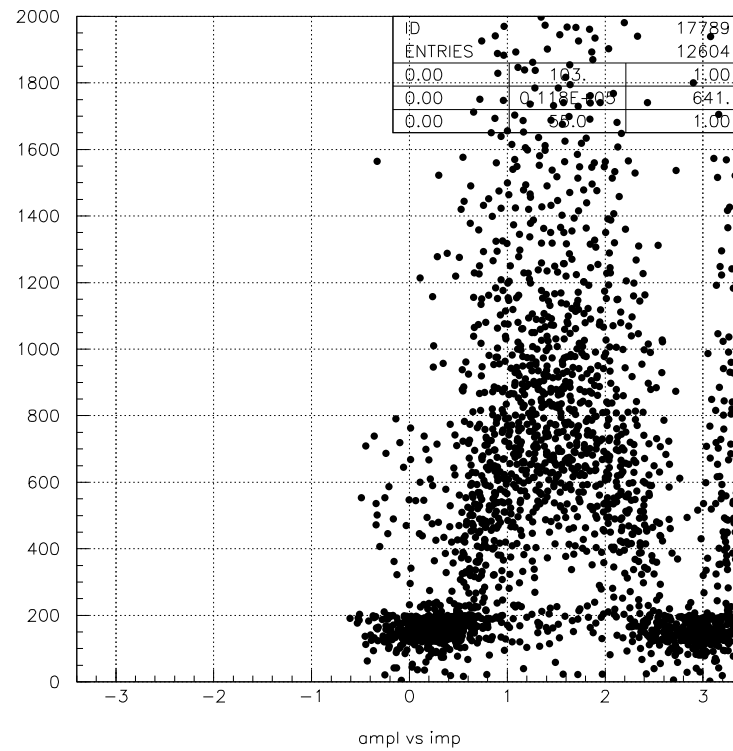
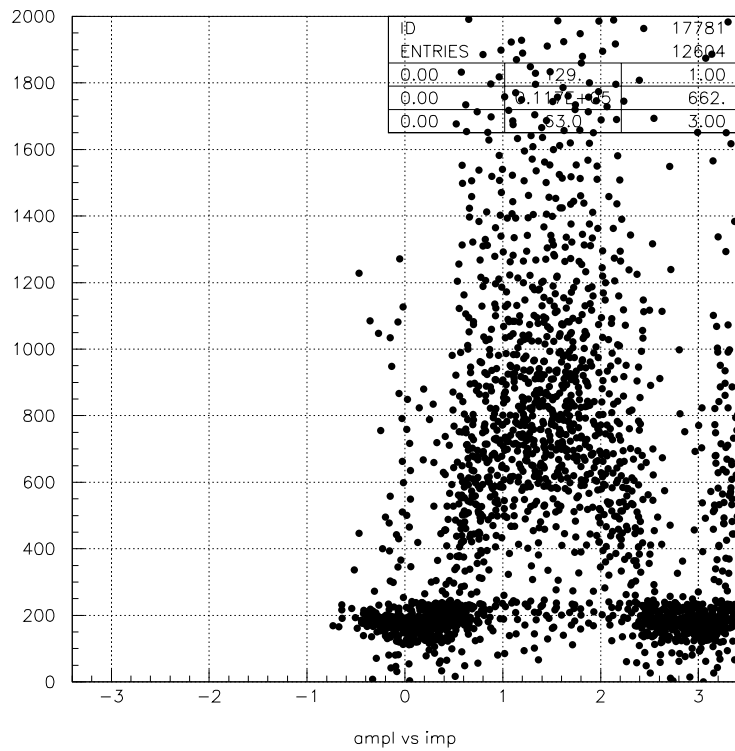
(VERY!) Preliminary STRs



Almost no selection in these **S**pace **T**ime **R**elations

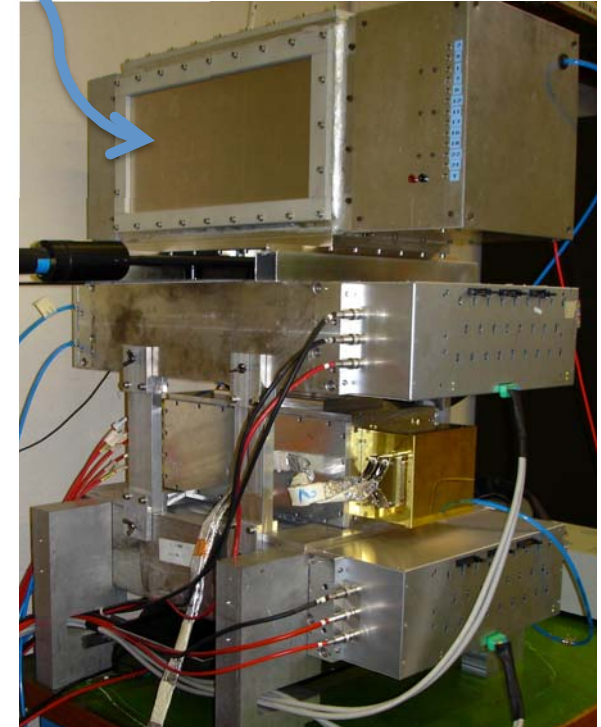
- Very loose χ^2 cut
- No constraint on amplitude (ADC reading)
- Expect to be able to clean up the above plots substantially

Charge vs. impact parameter - (VERY!) Preliminary



Waveform digitization

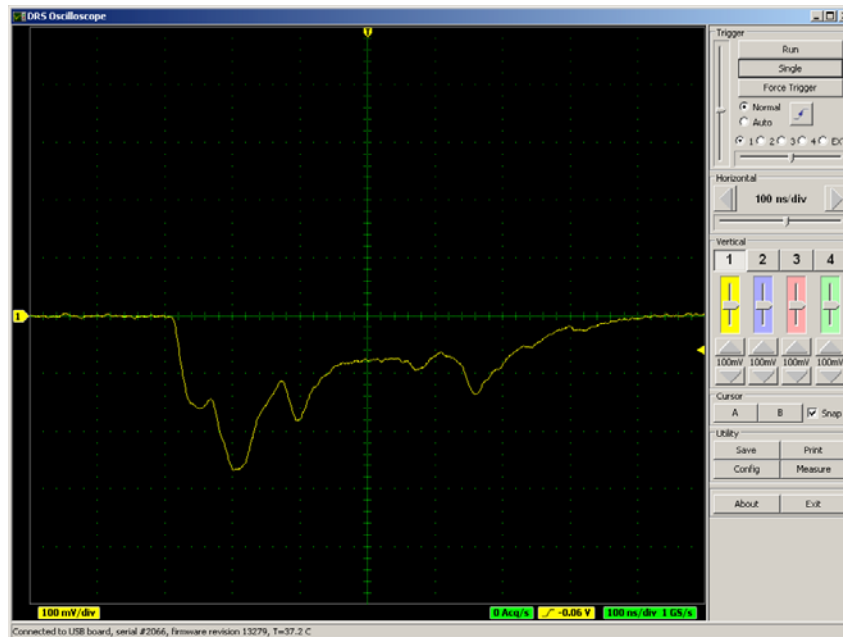
- Using old KLOE prototype (2:1 square cells), featuring higher bandwidth preamps than proto1
- Mounted on top of tracking telescope
- Read out through DRS4(*) “evaluation board”



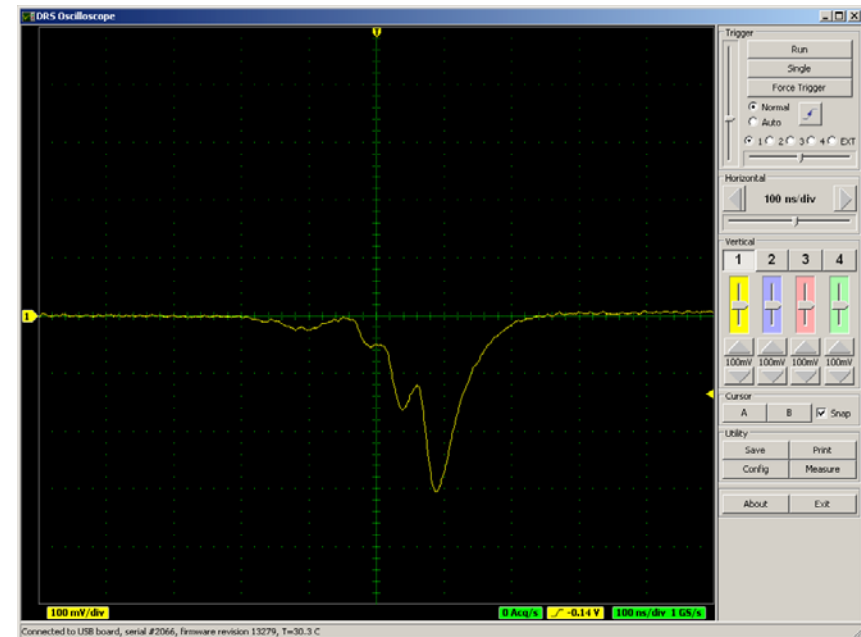
(*) A switched capacitor array (SCA) with 1024 cells, capable of digitizing eight analog signals with high speed (6 GSPS) and high accuracy (11.5 bit SNR) on a single chip (<http://drs.web.psi.ch/>) [only 4 channels read-out with current version of firmware]

Waveform digitization

- 2 “random” examples, self-triggered (ext. trigger can be used instead)
 - left: SuperB proto 1, preamp. bandwidth $\sim 100\text{MHz}$
 - right: KLOE proto 0.2, preamp. bandwidth $\sim 300\text{MHz}$
- 1024 cells, $1\text{GS}/\text{sec}$ $100\text{ns}/\text{div}$
- Work in progress to include digitized waveforms in the DAQ chain of tracking telescope
 - want to correlate recorded pulses with track impact parameter



12/02/09



G. Finocchiaro

11

Summary

- Although rather undermanned for various reasons, good progress in several areas
 - tracking telescope resolution as expected
 - proto 1 fully commissioned, first very preliminary results
 - setting up acquisition of waveform digitization
- Aim to start ASAP a systematic campaign of measurements